The Effect of Expanding Medicaid Prenatal Services on Birth Outcomes

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ABSTRACT

Objectives. Over 80% of US states have implemented expansions in prenatal services for Medicaid-enrolled women, including case management, nutritional and psychosocial counseling, health education, and home visiting. This study evaluates the effect of Washington State's expansion of such services on prenatal care use and low-birthweight rates.

Methods. The change in prenatal care use and low-birthweight rates among Washington's Medicaid-enrolled pregnant women before and after initiation of expanded prenatal services was compared with the change in these outcomes in Colorado, a control state.

Results. The percentage of expected prenatal visits completed increased significantly, from 84% to 87%, in both states. Washington's low-birthweight rate decreased (7.1% to 6.4%, $P = .12$), while Colorado's rate increased slightly (10.4% to 10.6%, $P = .74$). Washington's improvement was largely due to decreases in low-birthweight rates for medically high-risk women (18.0% to 13.7%, $P = .01$, for adults; 22.5% to 11.5%, $P = .03$, for teenagers), especially those with preexisting medical conditions.

Conclusions. A statewide Medicaid-sponsored support service and case management program was associated with a decrease in the low-birthweight rate of medically high-risk women. (*Am J Public Health.* 1998;88:1623–1629)

Socially vulnerable pregnant women in the United States experience persistently high infant morbidity and mortality despite advances in perinatal technology. In response, the federal government passed legislation in the 1980s allowing states to expand their Medicaid programs for pregnant women. While expansion of Medicaid eligibility is a major component of this legislation, states were also offered matching funds for "enhanced prenatal care services." These services augment traditional prenatal medical visits and can include care coordination, case management, risk assessment, nutritional counseling, psychosocial counseling, health education, and home visiting.[1] By the early 1990s, more than 40 states were offering enhanced prenatal care services to Medicaid-enrolled pregnant women.

Studies evaluating Medicaid eligibility expansions have found variable effects on prenatal care use and little impact on pregnancy outcomes.[2–5] Studies assessing statewide Medicaid-enhanced prenatal care programs have been more likely to demonstrate an effect on outcomes, although findings have still been variable—improvement in infant mortality and/or low-birthweight rates statewide,[6] for women on cash assistance only,[7] for Black women only,[8] or no impact on low-birthweight rates.[9] States vary greatly in the content and implementation of their enhanced prenatal care services programs, and additional evaluations of these programs are needed to assess their effectiveness.

Washington State's Medicaid expansion ("First Steps") began on August 1, 1989, and took full advantage of the federal initiatives—expanding and streamlining eligibility, increasing reimbursement, and offering enhanced prenatal care services. This study assesses the effects of Washington's enhanced prenatal care services by comparing changes in prenatal care use and low-birthweight rates in Washington with changes in these measures in Colorado, a control state. We hypothesized that Washington women enrolled in the Aid to Families with Dependent Children (AFDC) program would use more prenatal care and have fewer low-birthweight infants after enhanced prenatal services became available. We also hypothesized that the programs would have a greater effect in subgroups of women with high needs for social or medical support or with high rates of poor birth outcomes.

Methods

Study Population

Washington and Colorado residents who gave birth to live singleton infants and were enrolled in the Medicaid–AFDC program at the time of delivery composed the study populations. We chose women in the Medicaid–AFDC program because the eligibility requirements for this program

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remained constant in the 2 states throughout the study period. Washington's baseline study period was January 1 through July 31, 1989; the postintervention study period was January 1 through July 31, 1992. Owing to database availability, June 1 through December 31, 1989, served as Colorado's baseline study period and June 1 through December 31, 1992, as the postintervention study period. Women who received care from health maintenance organizations, who delivered in military hospitals, or who were identified as undocumented aliens were excluded. Since the majority of our analyses are stratified by age, we also excluded the few women with missing age data.

Colorado implemented changes similar to Washington's First Steps program, with the exception of enhanced prenatal care services. While AFDC eligibility requirements remained constant, Colorado expanded Medicaid eligibility for other forms of medical coverage to 133% of the federal poverty level, Washington to 185%. Colorado instituted presumptive eligibility and posted eligibility workers at high-volume prenatal care sites ("outstationing"). Washington streamlined the application process and outstationed eligibility workers in selected sites. Over the study period, Colorado increased physician reimbursement for the prenatal care, uncomplicated spontaneous vaginal delivery, and postpartum care package from $510 to $961, Washington from $750 to $1200. Both Washington and Colorado initiated media campaigns to encourage women to seek early prenatal care.

Both Washington and Colorado are western states with about 18% of their populations living in nonmetropolitan counties.[10] The median 1989 per capita income was nearly identical in Washington ($14 923) and Colorado ($14 821). In 1989, Colorado had 189 and Washington 190 nonfederal physicians for every 100 000 civilians.[11] The 2 states have similar structures for delivery of maternity care, with both obstetrician-gynecologists and a substantial proportion of family physicians offering these services.[11]

Data Sources

In both states, we used databases that linked vital records data with Medicaid claims and eligibility files. The linkage strategies have been evaluated to ensure that they produce equivalent linked files; they have been described elsewhere.[12] In Washington State, the Department of Social and Health Services' Research and Data Analysis performs ongoing linkage of vital records and Medicaid data.[13] The Colorado database was created specifically for this project. The birth certificates provided information on maternal demographics, residence, prior pregnancy history, chronic medical problems, pregnancy complications, month of initiation and number of prenatal visits, and birthweight. The Medicaid eligibility data provided dates of Medicaid coverage and identified the applicable Medicaid program type.

Washington's Support Services and Case Management Programs

Washington's support services program, available to all Medicaid-enrolled pregnant and postpartum women, provided assessment, education, intervention, and counseling by an interdisciplinary team of community health nurses, nutritionists, and social workers in either the home or office setting. Up to 10 visits were covered routinely; up to 20 visits were authorized for women eligible for maternity case management. Childbirth education, transportation, and child care during medical care were also funded by this program.

Case management was targeted to Medicaid-enrolled pregnant women who were under 18, had alcohol or drug use, or met at least 3 of the following criteria: were homeless; had experienced current or recent violence; lacked a support system; had medical factors related to poor outcome (e.g., diabetes, hypertension); had HIV/AIDS; had 2 or more children under age 5; had an eighth-grade education or less; had a physical disability; had mental impairment; initiated prenatal care later than 28 weeks; had refugee status; were aged 18 or 19; had limited English language proficiency. Case management included identification of client needs; creation of a written plan for care; linkage of clients with needed medical, social, and educational services; and follow-through to ensure that the case management plan was met.

Study Definitions

Independent variable. The independent variable was exposure to a system that reimbursed for maternity support services and case management. This distinguishes Washington births during 1992 from those during 1989.

Outcome variables. The first outcome variable, prenatal care use, was measured by the percentage of expected prenatal care visits completed by the woman; the number of expected prenatal care visits was based on American College of Obstetricians and Gynecologists' guidelines, adjusting for month of initiation of prenatal care and gestational age at birth as described by Kotelchuck.[14] The categorical variable identified the percentage of women who completed fewer than 50% of expected visits. We truncated the percentage of expected visits at 100% for the continuous variable, as we were interested in shifts in expected visits below this acceptable level. The month of initiation of prenatal care was not used as an outcome variable, inasmuch as more than 90% of the women entered prenatal care before they began support services or case management, suggesting that these programs were not a major mechanism through which prenatal care began.

The second outcome variable, low birthweight, was defined as a birthweight of less than 2500 g. Low-birthweight births were further subdivided into 3 categories for descriptive purposes: 2000 through 2499 g, 1500 through 1999 g, and less than 1500 g.

Descriptive and Control Variables

Risk factors that have been associated with poor birth outcomes were included as control variables: (1) age (<18, 18–34, 35+ years), (2) parity (0, 1–4, 5+), (3) racial/ethnic group (White, African American, Hispanic, Native American, Asian [Pacific Islander, Southeast Asian], other), (4) marital status, (5) history of prior premature births, (6) preexisting medical conditions (cardiac disease, chronic hypertension, or established or gestational diabetes), (7) complications of pregnancy (pregnancy-induced hypertension, eclampsia, anemia, oligohydramnios, incompetent cervix, first-trimester bleeding, abruptio placentae, placenta previa), (8) rural or urban residence of mother (urban is defined as living in a metropolitan area county, rural as all others), and (9) sex of the infant. Cigarette and alcohol use were not included as control variables because they are unreliable, as evidenced by the substantial differences between the 2 time periods in the proportion of women for whom these data were missing (Table 1).

Subgroup Analyses

Using the following categories, we looked for a differential effect of the study intervention on high-risk groups: (1) adults (18+ years) and teenagers (<18 years); (2) married and single women; (3) White, African American, Hispanic, Native American, and other racial/ethnic groups; and (4) "medically high-risk women" (those with 1 or more high-risk conditions—prior premature births, complications of pregnancy, or preexisting medical conditions) and "medically lower-risk women."

Statistical Analyses

Descriptive characteristics and outcome measurements between women in the

TABLE 1—Characteristics of Women in the Study Population in Washington and Colorado, 1989 and 1992

	Washington		Colorado	
	1989 (n = 6537)	1992 (n = 7555)	1989 (n = 4053)	1992 (n = 5065)
Age, y, %				
<18	7.3***	8.8	9.6	9.5
18–34	89.7***	86.7	87.1	86.4
35+	3.0***	4.5	3.3	4.1
Parity, %				
0	38.3	37.2	36.8	35.5
1–4	59.3	59.5	60.7	61.6
5+	2.4**	3.3	2.5	3.0
Race, %				
White	67.0	66.4	44.2	46.1
African American	9.1*	10.2	15.0**	13.0
Native American	6.8***	5.5	2.0	2.4
Hispanic	7.0**	8.3	37.7*	35.5
Asian	0.1***	2.3	0	0.1
Other	10.0	7.3	1.0	2.8
Married, %	26.9*	28.7	26.8***	32.1
Preexisting medical condition, %[a]	3.1	3.3	1.9*	2.5
Complications of pregnancy, %[b]	10.2**	11.6	6.2	7.2
Previous premature births, %	2.3*	1.7	1.9	1.6
Cigarette use, %				
No	44.0***	56.4	61.9***	69.4
Yes	40.9	40.0	30.4	29.8
Unknown	15.1***	3.6	7.7***	0.8
Alcohol use, %				
No	67.0***	89.5	85.2***	96.4
Yes	9.4***	4.6	6.3***	2.7
Unknown	23.6***	5.9	8.4***	1.0
Prenatal care, %				
First trimester	55.6***	64.7	49.4***	59.0
Second trimester	31.9***	27.5	36.6***	30.5
Third trimester	9.8***	6.6	10.9***	8.6
None	2.7***	1.2	3.1***	1.9
Male infant, %	50.5	51.6	51.5	50.2
Rural residence, %	20.8*	19.4	14.6	15.0

[a]Cardiac disease, chronic hypertension, or established or gestational diabetes.
[b]Pregnancy-induced hypertension, eclampsia, anemia, oligohydramnios, incompetent cervix, first-trimester bleeding, abruptio placenta, or placenta previa.
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$ (for within-state comparison of 1989 vs 1992).

pre- and postintervention study periods within states were compared. The χ^2 and standard t tests were used to test for statistically significant differences within states in these bivariate analyses. Logistic regression for dichotomous outcome variables and multiple linear regression for continuous outcome variables were used to test whether the change in outcome measures in Washington between 1989 and 1992 was significant with adjustment for the control variables and for secular trends as represented by the change in the outcome measures in Colorado. This was accomplished by fitting models that included an indicator for year, an indicator for state, and a variable indicating the interaction between the two. The coefficient on this interaction term measures the extent to which the change over time in Washington differs from the change over time in Colorado.

Results

Study Population

In Washington State, 6537 women in January through July 1989 and 7555 in January through July 1992 met our study criteria. Colorado's study population included 4053 women in the June through December 1989 study period and 5065 in the June through December 1992 period.

There were a number of differences in sociodemographic and maternity risk characteristics between 1992 and 1989 in the Washington and Colorado study populations (Table 1). A lower proportion of Washington's 1992 study population had had previous premature births. A higher proportion of Washington's study population had complications of pregnancy in 1992 than in 1989, primarily owing to an increase in the proportion of women with anemia (3.4% in 1989, 4.6% in 1992; $P < .001$). Colorado's 1992 study population had a higher proportion of women with preexisting medical conditions than did the 1989 study population, primarily because of an increase in the proportion of women with diabetes (2.0% vs 1.4%; $P = .04$). From 1989 to 1992, both states had significant increases in the proportion of women beginning prenatal care in the first trimester and significant decreases in the proportion of women beginning care in the second or third trimesters or receiving no care.

Use of Support Services and Case Management in Washington State

The majority of Washington's study population used maternity support services and/or case management during the 1992 study period (Table 2). Because all teenaged mothers were eligible for case management, they were more likely than adults both to use support services and to use case management. The proportions of Whites, African Americans, and Hispanics who used support services or case management were similar (56.3%–58.0%), while Native Americans (40.2%) used these services less. Medically high-risk women (59.4%) were slightly more likely to use these services than were women without high-risk conditions (55.3%). Approximately the same proportion of single and married women (56.0% and 55.8%, respectively) used support services and case management.

Use of Prenatal Care

In both Washington and Colorado we recorded a significant increase in the mean percentage of expected prenatal visits completed and a significant decrease in the proportion of women completing fewer than 50% of expected visits (Table 3). The change in prenatal care use in Washington was not significantly different from the change in Colorado.

Low-Birthweight Rates

In our study populations (Table 3), Washington's low-birthweight rate decreased from 7.1% in 1989 to 6.4% in 1992 ($P = .12$), while Colorado's increased slightly, from 10.4% to 10.6% ($P = .74$). The low-birthweight rate for singleton live-born infants in Washington State overall was 4.7% in 1989 and 4.3% in 1992. Colorado's low-birthweight rate for singleton live-born infants was 6.6% in 1989 and 7.2% in 1992.

The decrease in the low-birthweight rate for Washington's study populations was

TABLE 2—Maternity Support Services (MSS) and Maternity Case Management (MCM) Program Use in Washington State, January 1 through July 31, 1992

	All	Adults	Teens
All Women	(n = 7555)	(n = 6889)	(n = 666)
% Using MSS or MCM	57.2	56.0	70.1
Women using MSS or MCM	(n = 4323)	(n = 3853)	(n = 467)
Using MSS only, %	57.8	62.0	23.1
Using MSS + MCM, %	38.5	34.8	69.0
Using MCM only, %	3.7	3.2	7.9
% Initiating MSS or MCM in:			
First trimester	39.2	39.4	36.8
Second trimester	44.6	44.5	45.4
Third trimester	16.3	16.1	17.8
% With home prenatal MSS visits	39.1	38.2	46.5
Mean no. of prenatal MSS visits[a]	4.7	4.7	5.0
Mean no. of prenatal MCM mo[b]	3.1	3.0	3.4
Mean amt ($) spent on prenatal MSS and MCM	341	330	433

[a]Calculated only for those women using MSS.
[b]Calculated only for those women using MCM.

evident only in adults (7.1% in 1989, 6.3% in 1992; $P = .09$); teenagers experienced an increase in low-birthweight rates (6.9% in 1989, 7.4% in 1992; $P = .87$). Low-birthweight rates in Colorado's study population remained the same for adults (10.4% in 1989, 10.5% in 1992; $P = .85$) but increased for teenagers (10.3% in 1989, 11.6% in 1992; $P = .54$). Logistic regression, with adjustment for potential confounders, showed no significant differences between Washington and Colorado in changes in low-birthweight rates in the teenaged, adult, or overall study populations.

After adjustment for potential confounding variables, we found significant improvements in low-birthweight rates over the study period for women in Washington, compared with those in Colorado, in the following groups: single adults, African American adults, and adults and teenagers with medically high-risk conditions (Table 4). The improvements for single and African American adults were largely due to decreases in low birthweight rates for the medically high-risk women. Washington's medically high-risk subgroups experienced substantial declines in low-birthweight rates, while all but 1 of Colorado's medically high-risk subgroups experienced increases in low-birthweight rates. The medically lower-risk subgroups in both states experienced nonsignificant decreases or increases in low-birthweight rates.

To further explore which high-risk conditions were most strongly associated with improvement in low birthweight rates for Washington's study populations, we disaggregated the 3 components of the high-risk variable—preexisting conditions, complications of pregnancy, and a history of previous premature birth. The greatest effect on low-birthweight rates was in adult women with preexisting conditions (15.8% in 1989, 5.9% in 1992; $P = .001$). There was a more modest effect in women with complications of pregnancy (18.7% in 1989, 14.7% in 1992; $P = .05$). No effect was seen in women with previous premature births (25.7% in 1989, 28.1% in 1992; $P = .75$).

Discussion

Implementing Medicaid maternity support service and case management programs was associated with a decrease in the low-birthweight rates of medically high-risk, AFDC-enrolled women in Washington State. The decrease in low-birthweight rates was most dramatic for high-risk women with preexisting conditions, over 90% of whom had diabetes or chronic hypertension. This is consistent with the literature on the effects of hypertension and the management of diabetes on birth outcomes.[15–18] Both of these conditions require frequent visits, close monitoring, and compliance with treatment, all of which the case management and support service programs were designed to encourage.

Low-birthweight rates also improved for high-risk women with complications of pregnancy such as pregnancy-induced hypertension and anemia. We cannot determine whether providing women with services after they developed a complication or having these women already connected with services when they developed a complication was important. It is possible that women receiving enhanced prenatal services had

TABLE 3—Unadjusted Prenatal Care Use and Low-Birthweight Rates Per 100 Births for Women in the Study Population in Washington and Colorado, 1989 and 1992

	Washington		Colorado		
	1989 (n = 6537)	1992 (n = 7555)	1989 (n = 4053)	1992 (n = 5065)	Interaction P[b]
Prenatal care use, %					
Mean expected prenatal visits[a]	84.0*	86.8	83.8*	87.1	.76
<50% expected prenatal visits	7.9*	5.1	8.4*	5.6	.52
Birthweight, %					
<2500 g	7.1**	6.4	10.4	10.6	.10
2000–2499 g	4.7	4.4	7.2	7.7	
1500–1999 g	1.4	1.1	1.9	1.8	
<1500 g	0.9	0.9	1.3	1.2	

[a]Maximum % expected visits is 100%.
[b]The interaction P value tests whether the change in Washington is different from the change in Colorado after adjusting for potential confounding variables.
*$P \leq .001$, for within-state comparison of 1989 vs 1992.
**$P = .12$.

TABLE 4—Low-Birthweight Rates Per 100 Births by State, Subgroup, and Risk Status

	Low Birthweight, % (No.)				
	Washington		Colorado		Interaction
	1989	1992	1989	1992	P^a
Medically high-risk adults	18.0** (857)	13.7 (1075)	18.0 (361)	20.8 (495)	.01
Nonmedically high-risk adults	5.3 (5187)	4.9 (5805)	9.5 (3304)	9.2 (4088)	.67
Single adults	7.6 (4318)	6.6 (4770)	10.6 (2617)	12.1 (3001)	.01
High risk	17.7*** (593)	13.8 (749)	17.9* (252)	26.3 (312)	.002
Lower risk	6.0 (3725)	5.3 (4021)	9.8 (2365)	10.4 (2689)	.11
Married adults	5.8 (1716)	5.6 (2096)	9.8* (1048)	7.5 (1581)	.11
High risk	18.7 (262)	13.5 (326)	18.3 (109)	11.5 (183)	.74
Lower risk	3.5 (1454)	4.2 (1770)	8.8 (939)	7.0 (1398)	.04
African American adults	14.6 (534)	11.9 (682)	13.6 (543)	16.4 (596)	.03
High risk	31.6* (95)	18.5 (173)	12.0**** (50)	28.6 (63)	.004
Lower risk	10.9 (439)	9.6 (509)	13.8 (493)	15.0 (533)	.38
White adults	6.4 (4108)	5.5 (4637)	10.6 (1668)	9.4 (2182)	.70
High risk	17.4* (533)	13.1 (636)	17.3 (162)	20.3 (207)	.09
Lower risk	4.7 (3575)	4.3 (4001)	9.9 (1506)	8.3 (1975)	.63
Teens	6.9 (476)	7.4 (665)	10.3 (388)	11.6 (482)	.90
High risk	22.5 (80)	11.5 (96)	10.3 (29)	20.9 (43)	.03
Lower risk	3.8 (396)	6.7 (569)	10.3 (359)	10.7 (439)	.14

[a]The interaction P value tests whether the change in Washington is different from the change in Colorado after adjusting for potential confounding variables.
*$P \leq .05$; **$P \leq .01$ (for unadjusted within-state comparison of 1989 vs 1992); ***$P = .055$; ****$P = 0.56$.

earlier detection of and intervention for their pregnancy complications.

Low-birthweight rates did not change among women with a history of premature birth. This is consistent with the findings of several studies that have evaluated the role of behavioral and educational strategies to prevent preterm labor.[19]

The 10% overall decrease in the low-birthweight rate for Washington's AFDC-enrolled women was not statistically significant, but it was clinically significant, particularly since the baseline low-birthweight rate in this group was relatively low, leaving less room for improvement. Over the same time period, there were minimal increases in the low-birthweight rate for Colorado's study population (10.4% to 10.6%) and in the national low-birthweight rate (7.0% to 7.1%).

Our finding that the greatest decrease in low-birthweight rates occurred among medically high-risk women adds additional insight into the effects of social support and comprehensive prenatal care on birthweight, and it emphasizes the importance of early detection of medical risks and pregnancy complications. While a number of observational and nonrandomized controlled trials of social support and comprehensive prenatal care programs have demonstrated improvements in low-birthweight rates,[6,20–22] randomized controlled trials of social support and comprehensive prenatal care programs have been less likely to demonstrate an impact of these interventions on low-birthweight rates.[23–26] Like this study, those trials that have found program effects did so in subgroups of women with higher risks, including high-risk Blacks,[27] young teenagers,[28] and primiparous women.[29]

Prenatal care use, including both trimester of initiation of prenatal care and percentage of expected prenatal care visits completed, improved significantly in both the Washington and Colorado study populations. This improvement might be explained by the fact that both states streamlined their eligibility processes, increased reimbursement to obstetric providers, and instituted media campaigns. Low-birthweight rates among the medically high-risk populations decreased only in Washington, however, suggesting that this improvement was associated with the provision of support services and case management rather than traditional prenatal care. The lack of improvement in Colorado's low-birthweight rates is consistent with several studies that have demonstrated that increasing prenatal care use in low-income populations alone may not improve birth outcomes.[2–4,30]

This study has several limitations. First, this is a natural experiment rather than a randomized trial. We cannot conclusively identify the support service and case management programs as the cause of Washington's improved low-birthweight rate, since other factors could have affected it. If Washington's Medicaid–AFDC program enrolled a lower-risk population and/or Colorado's program enrolled a higher-risk population in 1992 than in 1989, we would have overestimated the effects of the support service and case management programs on low birthweight. There is, however, no consistent evidence of such a differential in the population characteristics available on the birth certificates. In addition, the support service and case management programs may have promoted identification of women with less severe preexisting conditions or medical complications in Washington, again leading to an overestimate of the effect of these programs.

We are also unable to identify which features of the support service and case management programs may be associated with the improved low-birthweight rate. Which types of services have a greater influence on low-birthweight rates? How many visits are needed to have an impact? At what point during pregnancy should these services begin? A randomized controlled trial targeted at high-risk women is needed to confirm this study's findings and to identify the program features that lead to improvement in low-birthweight rates.

The substantial increase between 1989 and 1992 in the low-birthweight rates for some of Colorado's medically high-risk subgroups was unexpected, and for some subgroups it made the improvement in Washington's low-birthweight rates appear more dramatic. We cannot explain these findings. Because the improvement in all of Washington's medically

high-risk subgroups was very consistent, and in most cases significant, our study conclusions would not change if Colorado's comparison data were not available.

Second, methodological issues limited this study to AFDC-enrolled women only, while the support service and case management programs both in Washington and in other states are available to pregnant women in other Medicaid programs. Other studies of the effect of support services and case management programs are needed to determine whether these findings can be extrapolated to other Medicaid enrollees.

Third, this study's use of birth records carries with it the limitations of a secondary database. Studies of the accuracy of recording on the birth certificate variables such as complications of pregnancy and preexisting conditions suggest that they are poorly reported.[31,32] There were significant differences in the reported rates of women with these conditions between 1989 and 1992 in both states. While no changes were made in the formatting of the high-risk variables on the states' certificates between 1989 and 1992, electronic birth certificate reporting began in Washington in 1992.

Because of the large proportion of missing values for the smoking and drinking variables in 1989, especially in Washington, we cannot measure the true change in cigarette and alcohol use and the potential effect of these important variables on our study outcomes in the 2 states.

Another limitation of using birth certificates is that few outcome measures are available. The support service and case management programs had many goals, such as improving parenting skills, reducing child abuse and neglect, decreasing maternal stress, and improving maternal nutrition, which this study could not evaluate.

Washington State's Medicaid-sponsored support service and case management programs were associated with a decrease in the low-birthweight rate of medically high-risk, AFDC-enrolled women. This low-birthweight rate was still substantially higher than the low-birthweight rate of other AFDC-enrolled women. This finding, as well as the lack of a significant change in other groups of women, suggests that additional strategies are needed to improve birth outcomes further. In addition, the improvement in low-birthweight rates was in the medium low-birthweight range (1500–2499 g), which means that this intervention did not affect the highest-risk, highest-cost infants. A recent editorial in this journal suggested that infectious etiologies must be addressed to improve the low-birthweight rates.[33] Clearly a full range of strategies, some of which are yet to be identified, will be needed to decrease this country's low-birthweight rate. This study suggests that offering enhanced prenatal care services can serve as one of these strategies for the subgroup of women with high medical risks. □

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